ICIC Express Letters, 3(3): 727-732

Adaptive controller design and implementation for a bldc motor drive system

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Abstract

Because of high power density, low maintenance, compactness, and ease ofcontrol, the dc brushless (BLDC) motor has been applied, more and, more popularin the industry, such as computer, automotive, aerospace, industrial and,household, products. Moreover, BLDC motors have advantages of long lifetime,faster response, large power to volume ratio, and, low noise as compared withthe dc servo motor. According to the signals produced, by the shaft encoder, theswitching patterns of the inverter can be determined, in the BLDC motor drivesystem,. Considering the controller design for a BLDC motor drive system, theproportional-integral (PI) controller has been widely used, for a long time dueto its simplicity and reliability. Unfortunately, using a fixed PI controller,it is difficult to obtain both a good transient response and a good loaddisturbance rejection. To solve this problem, an adaptive backsteppingcontroller, which can be a, feasible control law for a, BLDC motor controlsystem, has been proposed. All the control loops, including the switchingstrategy and, control law, are implemented by a, TMS320L F2407A DSP. Severalexperimental results are shown to validate the theoretical analysis.

Key words: Adaptive backstepping controller; BLDC motor; DSP; Inverter; Shaft encoder